APPLICATION FOR UNITED STATES LETTERS PATENT

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TITLE: SLIDE RING SEAL ASSEMBLY INCLUDING A RADIAL, ROTATION-PREVENTING ARRANGEMENT

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CROSS REFERENCE TO RELATED APPLICATION

[1] This application claims the priority of German Application No. 101 04 788.6 filed February 2, 2001, which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[2] The invention relates to a slide ring seal assembly, particularly a seal assembly for running gears. The seal assembly is composed of two, back-to-back arranged, cross-sectionally angled (L-shaped) slide rings whose axially extending legs form a seat for a stationary, cross-sectionally generally trapezoidal, resilient sealing body. The sealing bodies are secured against displacement by depressions provided in the outer upper surface of the legs.

[3] Slide ring seal assemblies are used on shafts and axles and are inherently exposed to substantial soiling. Exemplary structures in which the slide ring seal assemblies may be used are drive axles of construction machinery or track-laying vehicles which are continuously exposed to sand, dust, mud and the like. Slide ring seal assemblies,

particularly running gear seal assemblies where the slide rings have a cross-sectionally angled configuration often have cross-sectionally trapezoidal, spring-washer-shaped sealing bodies in which the slide rings are elastically supported. The annular sealing bodies which act as springs take over the function of the axial sealing pressure, the static seal between slide ring and seating bore and the frictional torque transmission. The axial force required for ensuring a seal is obtained by upsetting the elastic sealing body between the slide ring and its seating bore as the seal is stressed to assume its dimensions in the installed state. Particularly upon frictional torque transmission and distortion of the sealing body during installation or service, often malfunctioning and breakdown of the sealing properties are experienced.

[4] A known slide ring seal assembly of the above-outlined type is described, for example, in German Patent No. 197 53 918. This patent describes a slide ring seal assembly having annular, cross-sectionally trapezoidal sealing bodies which are disposed between the axial legs of the slide rings and the seating bore. At the contact faces of the slide rings frictional torques appear which are transmitted by the sealing body to the housing. By virtue

of the different distances from the axle center and thus from the null-line of the frictional torques, different forces in the supported surfaces of the sealing bodies appear. Thus, a relatively large force is obtained because of the short distance (leverage) to the outer upper face of the axial leg of the slide ring. A large distance (leverage) and thus a small force prevails between the null-line and the upper face of the seating bore. The frictional torques are conventionally transmitted by the surface pressure to the supporting surfaces of the sealing bodies. Due to the relatively high force effect on the outer upper surface of the axial leg of the slide ring, often the sealing body rotates with respect to the slide ring. Such a rotation causes a breakdown in the seal and thus renders the slide ring seal assembly defective.

[5] To cure the above-outlined difficulty, United States Patent No. 4,421,327 describes a slide ring seal assembly which includes a securing arrangement for preventing rotation of the sealing body. The forces on the upper surface of the axial leg of the slide ring are additionally taken up in a form-fitting manner by depressions provided therein. The sealing body thus can transmit significantly larger frictional torques. Such

structures, however, involve the risk that the axially outer sealing body is twisted during dynamic stresses or even already in its installed state. As a result of such twist, the sealing body lifts off the radially outer upper surface of the slide ring leg, whereby a gap is formed between the slide ring leg and the sealing body. Dirt or lubricating oil may gain access to such a clearance. As an undesired result, the function of the slide ring seal assembly and the transmittable frictional torques are not optimal.

SUMMARY OF THE INVENTION

[6] It is an object of the invention to provide an improved slide ring seal assembly which avoids the above-outlined disadvantages and which ensures a reliable operation.

[7] This object and others to become apparent as the specification progresses, are accomplished by the invention, according to which, briefly stated, the slide ring seal assembly includes a slide ring having an axially extending annular leg. The leg has radially outer and radially inner circumferential surfaces and a free axial end. A plurality of circumferentially spaced recesses are provided in the leg

at the free axial end thereof. Each recess extends from the radially outer surface to the radially inner surface. An annular sealing body surrounds the leg and is seated thereon. Circumferentially spaced, radially inward-oriented extensions forming part of the annular sealing body and projecting into respective recesses are provided in the leg for effecting a form-locking connection between the slide ring and the annular sealing body.

[8] The invention overcomes the above-discussed mechanical disadvantages by virtue of the fact that the outer ends of the axial legs have recesses which reach from the outer surface to the inner surface, and the radially inwardly oriented extensions formed on the trapezoidal sealing body are received in the recesses. As a result, the trapezoidal sealing body is prevented from shifting in the circumferential direction. The recesses are so dimensioned that even in case of an unavoidable axial twisting of the sealing body, a radially sufficient overlap is preserved to prevent a rotary motion of the sealing body. Primarily, however, the recesses and the extensions inserted therein serve for transmitting the frictional torques which are generated. In addition to the frictional transmission of the friction torques, the latter are also transmitted by a

form fit. A turning of the sealing body (sealing ring) relative to the sliding ring is thus not possible.

[9] To counteract a twisting of the sealing body and thus a risk that a gap will be formed, on the axial leg, at the inner surface, in the region of the recesses, undercuts may be provided into which the correspondingly shaped extensions of the sealing body may project.

[10] According to a further advantageous feature of the invention, in addition to the undercuts, the axial legs of the slide rings have a radially outward-oriented enlargement at their axially outer end. The enlargements serve as supports underneath the sealing bodies to prevent a twisting thereof in the region between the recesses.

BRIEF DESCRIPTION OF THE DRAWINGS

[11] Figure 1 is a fragmentary axial sectional view of a preferred embodiment of the slide ring seal assembly according to the invention.

[12] Figure 2 is a fragmentary radial view of a slide ring structured according to the invention.

[13] Figure 3 is a sectional view taken along III-III of Figure 2, showing a sealing body in phantom lines.

[14] Figure 4 is an enlarged end view of a slide ring leg as viewed in the direction of the arrow IV in Figure 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[15] Figure 1 shows a slide ring seal assembly 1 having cross-sectionally trapezoidal annular sealing bodies 2, 3 and cross-sectionally angled (L-shaped) slide rings 4 and 5. The slide rings 4 and 5 have axially oriented annular legs 6, 7 which, at their outer ends 8 and 9 are provided with recesses 10 and 11 which extend from the radially outer circumferential surface 12 to the radially inner circumferential surface 13 of the respective legs 6, 7. The sealing bodies 2, 3 have, in the region of the recesses 10, and 11, radially inward oriented extensions 14, 15 which are received by the respective recesses 10 and 11.

[16] Figure 2 shows, in the region of the recess 10, one part of a slide ring 4 according to the invention. The leg of the slide ring 4 has, at its axially outer end 20, a circumferentially extending enlargement 21 and an axially extending undercut 19 is shown in broken lines.

[17] Figure 3 illustrates the slide ring 4 along the section line III-III to show the recess 10, the undercut 19 and the radial enlargement 21. The annular sealing body 2 seated on the upper surface 12 of the axial leg 6 is shown in broken lines. The radial extension 14 of the sealing body 2 extends into the recess 10. The radial extension 14 further has an axial projection 26 which is received in the undercut 19.

[18] Figure 4 which is a full end view of the slide ring leg 6, illustrates the enlargement 21 and further shows, in an exemplary manner, four circumferentially uniformly distributed recesses 10, each continuing with an axially inward extending undercut 19.

[19] It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.